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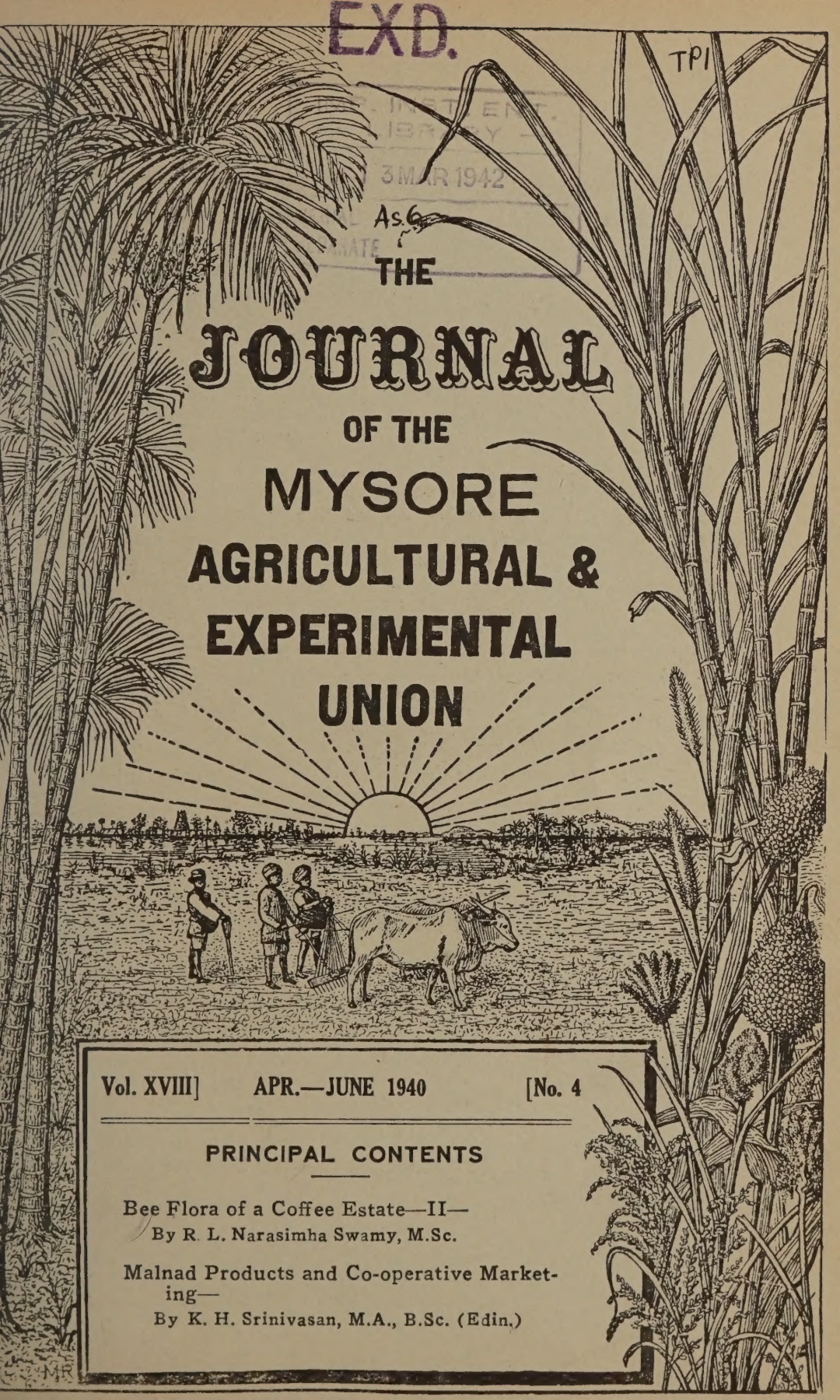
THE JOURNAL OF THE MYSORE AGRICULTURAL & EXPERIMENTAL UNION



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THE JOURNAL OF THE MYSORE AGRICULTURAL AND EXPERIMENTAL UNION

A quarterly magazine devoted to the advancement of Agriculture and published by the Mysore Agricultural and Experimental Union

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The Journal
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Vol. XVIII] APR.—JUNE 1940 [No. 4

Bee Flora of a Coffee Estate—II

By

R. L. Narasimha Swamy, M.Sc.

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A brief list of plants that commonly grow or are grown in coffee estates and that are visited by bees for nectar and pollen was published in a preceding issue of this *Journal.** Another list of plants on similar lines is presented here. The list will further support the contention that planters need not concern themselves with growing plants separately to provide food for bees. For, every coffee estate has a wide belt of jungle in which grow several plants that provide nectar and pollen. It is a common sight to find bees hiving on tree trunks and sheltered places in the jungle. The bees obtain their food from plants growing in the jungle. Therefore, planters have only to organise the wild production of honey to their own benefit. Honey is an article of diet and pure honey is rather difficult to obtain. As such planters may take up bee culture as a hobby to be pursued during leisure hours.

* "Bee Flora of a Coffee Estate—I," *The Journal of the Mysore Agricultural and Experimental Union*, Vol. XVIII, No. 1, pp. 11–15.

Crop Plants

Citrus spp.—*C. aurantium,* the orange, *C. decumana,* the pumelo, and *C. medica* var. *acida,* the sour lime, are visited by bees for nectar throughout the day.

Gossypium spp.—Flowers of cotton, *G. purpurascens, G. vitifolium, G. peruvianum* and M.A. II are visited by bees for pollen.

Dolichos biflorus.—Horsegram which is used as a green manure plant, provides pollen for the bees which visit the flowers during the day.

Acacia concinna.—Seege grows in and round about coffee estates. It flowers during February–April. Bees visit the flowers for pollen during morning hours.

Crego de la India.—This imported fodder grass was observed to flower from August until December. The flowers are visited by bees in numbers for pollen.

Shade Trees and Other Plants

Erythrina lithosperma.—Dadap flowers are visited by birds for drinking the nectar that is in abundance. Few bees visit the flowers. However, bees are observed to visit the glandular stipels of the leaflets for nectar. The stipels are pouchlike and contain nectar.

Trewia nudiflora.—This tree is sometimes used as shade tree for coffee. It flowers during January–February. The flowers are visited by bees for pollen during morning hours.

Sapindus laurifolius.—The leaves of *thakote* are commonly used for shading nursery pendals in coffee estates. The tree flowers during February–April. The bees visit the flowers during morning hours for pollen.

Cedrela toona.—Gandhagarige or white cedar flowers during December–February. The honey-scented flowers are visited by bees for nectar during morning hours.

Bassia latifolia.—Kadu hippe flowers during February–March. The flowers are visited by bees throughout the day for nectar. Rock bees visit the flowers until a late hour in the evening.

Cetharexylum subserratum.—A common ornamental shrub; it flowers during August–September. The flowers are visited by bees for nectar.

Jungle Trees

Dillenia pentagyna.—The tree flowers during March–April. The flowers are visited by bees during morning hours for pollen.

Kadsura roxburghiana.—This is a climber flowering during February–April. The flowers are visited by bees for pollen. Rock bees were observed to visit the flowers in swarms until a late hour in the evening.

Pittosporum dasycaulon.—A small tree; it flowers during December–February. The flowers are visited by bees for nectar during morning hours.

Kydia calycina.—This tree flowers from October to December. The flower has ten droplets of nectar, one on either side of each petal. Bees visit the flowers for nectar.

Luvunga eleutherandra.—This climbing shrub produces sweet scented flowers during January–February. Bees visit the flowers for nectar throughout the day.

Careya arborea.—The tree blossoms during March-April. The big flowers are visited by birds for nectar which is in abundance. However, bees visit the flowers for mostly pollen and also for nectar.

Plectronia didyma var. *umbellata.*—The tree flowers during January–February. The flowers are visited by bees throughout the day for nectar. Bees were observed to be hovering near the flowers until a late hour in the evening.

Callicarpa lanata.—This small tree produces pink blossom during January–April. The flowers are visited by bees throughout the day for pollen.

Mallotus albus.—The trees were observed to flower from June until October. Bees visit the flowers for pollen during early morning hours.

Gironniera reticulata.—The trees flower during January–March. The flowers are visited by bees for pollen during morning hours.

Celtis tetrandra.—These trees flower during February–March. The flowers are visited by bees for pollen during the morning hours.

Weeds

Sida rhombifolia.—This weed flowers from September to November. Bees visit the flowers in large numbers for pollen throughout the day.

Triumfetta rhomboidea.—This common weed flowers from September–November and may continue to flower until March. Bees visit the flowers for pollen.

Justicia montana.—This weed is observed to flower from September–October to April–May. Bees visit the flowers for nectar throughout the day.

Leucas mollissima.—This weed grows commonly in marshy places. It flowers during January–March. The flowers are visited by bees for nectar throughout the day.

Curculigo orchioides.—This herb flowers during the south-west rains. Bees are observed to visit the flowers for pollen.

Heteropogon contortus.—The spear grass begins to flower at the end of south-west rains and continues to flower until December. The flowers are visited by bees for pollen throughout the day.

Malnad Products and Co-operative Marketing

By

K. H. Srinivasan, M.A., B.Sc. (Edin.)

Senior Assistant Director of Agriculture, Chickmagalur

Mysore is essentially an agricultural country although we have several industries both large and small. In addition, we have many kinds of rural industries. The soil and climatic conditions are very favourable and varied. The south-west and north-east monsoons are plentiful and in addition, we have copious supply of water from thousands of tanks and irrigation channels to grow wet crops. All these natural advantages make it possible in Mysore to grow several varieties of crops.

It is a pertinent question that the raiyat often asks us as to what use is there in increasing production, when he cannot get decent price or an assured market for the commodities he grows. This is a complicated question depending upon the law of demand and supply and no simple and straightforward answer could be given. However, an approach to solve this problem is only possible through the medium of co-operation which is a sovereign remedy envisaged by many who are experienced in this vast field. In short, the only hope of the agriculturist getting better prices or regular customers is through co-operative marketing organisations.

It is regretted to observe that co-operative marketing has not received the attention or the support of our raiyats as it deserves. While credit societies have multiplied and flourished, this branch of co-operative activity is languishing and this is due to several causes. Without entering into the details, I must point out that the heavy indebtedness of our raiyats and the peculiar nature of our rural financing system are mainly responsible for such a set-back. The raiyats usually borrow from the local money-lender, who is also

generally a merchant. It is a condition precedent, that when money is advanced at interest varying from 12 to 18 per cent. that the crop also should be marketed through him only. Besides, the raiyats have to pay commissions and other considerations peculiar to trade in particular agricultural commodity. These are obligations from which the raiyat cannot escape so long as our rural economic and financial system is intimately linked with local merchants, bankers and *dalals*. It is these vested interests which stand in the way of our raiyats progressing through co-operative agencies. It is no exaggeration to say that most of our raiyats, especially those of the *malnads*, have become serfs attached to local money-lenders and serfdom is being perpetuated.

Now the question arises if there can be any way out for our raiyats to emancipate from their present pitiable condition. Government, having realised the gravity of the situation, have introduced measures such as the Agriculturists' Relief Act and the Debt Conciliation Boards, which are intended to bring direct relief to the stricken raiyats. The Land Mortgage Banks are started to help the raiyats to get loans on long terms at cheaper rate of interest. Government have also actively supported the starting of co-operative marketing societies or joint-stock concerns for the disposal or marketing of agricultural products of the State. Before proceeding to show how Government have actively taken steps to help the *malnad* raiyats, it is necessary to briefly explain the objects of co-operative marketing societies.

The main principle underlying co-operative marketing is the elimination of middlemen such as *dalals* and several retailers, who are unnecessary between the producers and the consumers. In foreign countries, where co-operation has been developed to perfection, they have been successful in eliminating middlemen and have established direct contact with consumers, by having their own clearing houses or stores. Perhaps, in our country this state of perfection cannot be had for a long time to come. What we can hope to do is to eliminate the weaker and the unnecessary links in the chain of distribution and thus save part of the profits.

In the prevailing system of marketing, the producers get about 50 to 60 per cent. of the price paid by the consumers. The rest goes to cover the cost of transport, packing and middlemen's profit. The marketing reports published by the Marketing Adviser to the Government of India have brought out these facts clearly. Thus, it is seen that the long chain of middlemen take a big slice out of the profits that should normally be divided between the producers and the consumers. Besides, the army of middlemen tend to swell the prices ultimately paid by consumers and therefore this not only strains the purse of the consumers but also limits the consumption of goods liberally. The middlemen are not particularly helpful to maintain quality of the goods or the way in which they are marketed. When the quality and market standards are not observed, there is always difficulty in getting good customers. A co-operative marketing organisation can, not only maintain quality and marketing standards, but also can supply goods cheaper to consumers and avoid unnecessary competition.

A brief review is given below showing what steps have been taken by Government and the concerned Departments to help the *malnad* raiyats with regard to several crops.

1. *Arecanut.*

This is an important *malnad* product, mainly coming from the districts of Shimoga and Kadur. Between these two districts, there is an area of about 28,000 acres and they produce about 8 lakhs of maunds of finished areca which brings a gross income of nearly 40 lakhs of rupees. This is the money crop of the raiyats, while paddy only provides them with food for themselves and their family. Arecanut is subjected to heavy attacks of *Koleroga* and if its onslaught is not checked in time by Bordeaux spraying, no crop will be left on the trees. The attempts of the Agricultural Department have become successful, in that the raiyats have taken up to spraying. To help the raiyats to get spraying chemicals, the Department maintains several depots in convenient centres and stocks the requisite chemicals and

sprayers. Besides, credit facilities are afforded to raiyats to purchase these materials. In addition to Government depots, private co-operative societies are encouraged to stock sprayers and chemicals, by affording them special concessions. I am glad to say that two co-operative societies, *viz.*, Sri Sharada Co-operative Society of Sringeri, and Sri Vinayaka Co-operative Society of Bikli, have undertaken this work for the past two or three years. During last season, the former society has purchased sprayers and chemicals to an extent of about Rs. 2,500, and the latter for Rs. 1,800. These societies are supplied with materials at their godowns from Government Depots and the wages of a Fieldman for four or five months are paid to them. Besides, to defray godown rent, a monthly rent of Rs. 5 is paid to the societies.

As regards marketing of finished arecanuts, the prevailing practice has been for the raiyats to send their goods to the *mandies* of their creditors. There are *mandies* in Koppa and Thirthahalli, but the principal centre of trade is Shimoga where there are about 18 *mandies*. The principal ones among these transact business from 25 maunds up to 1 lakh. Since the consensus of opinion among the raiyats was in favour of co-operative marketing, Government have recently started the Malnad Arecanut Marketing Co-operative Society, Ltd., at Shimoga. The Deputy Commissioner is the Chairman of the Society. Government have very kindly sanctioned a subvention of Rs. 3,000 per annum for meeting working expenses. Raiyats have shown keen interest in this Society and are becoming members. The Society has established depots for collecting arecanuts at Koppa and Thirthahalli. The salvation of the arecanut-growing raiyats depends upon the successful working of this Society.

2. *Coffee.*

This is the principal product of Kadur and Hassan *malnads*. The area under coffee is about 1,10,000 acres. The capital sunk in this industry represents a colossal sum of more than 3 crores of rupees. This industry has not only brought civilization to the interior of *malnad* but also

brings in a gross income of about 45 to 50 lakhs of rupees annually to the growers. The indebtedness of the large or small planter is no exception to this important agricultural pursuit.

The experiments conducted by the Government Coffee Experimental Station, Balehonnur, have been very helpful to the planters in increasing their production by stopping the havoc done by disease and pests. The Agricultural Depots stock sprayers and spraying chemicals and issue them to planters on credit. More than 20,000 acres are sprayed annually and by doing so, not only production is increased, but also the crop that would have succumbed to diseases is saved. In terms of money, this may be from Rs. 50 to Rs. 75 per acre. The Coffee Experimental Station has also started distributing improved seed coffee for trials on a small scale.

Apart from the above services rendered by the Agricultural Department, Government have very kindly introduced a system of *taccavi* loans to planters at 4½% interest. This scheme is in force for the past three years and many of the large and small planters are benefited under this scheme. In the near future, it is anticipated that the scheme will be further liberalised so that greater number of planters may benefit thereby.

The solicitude of Government to further the interest of planters has gone a step further. Hitherto coffee marketing and processing was mainly confined to Mangalore. Recently the Mysore Coffee Curing Works, Ltd., was started at Chickmagalur with the active financial help of Government. The main objects with which this concern has been started may be noted as follows:—(1) to create a market for Mysore coffee at Chickmagalur, (2) to save in the transport charges, (3) to enable planters to realise better prices, (4) to make the Curing Works as a purveyor for all planters' requisites, and (5) to supply pure coffee, raw or powdered. The Curing Factory has started its first year's work and is in full swing. It is the duty of all Mysore planters to patronise their Curing Works.

3. *Cardamoms.*

This is the most important money crop of the raiyats of the Hassan and Kadur Districts and more especially of the former. In the Hassan *malnad* arecanut is non-existent and cardamom occupies the same position in the rural economy of the raiyats in Hassan as arecanut in Shimoga. The total area under cardamoms may be put down at about 25,000 acres in the two districts but Hassan has the greater portion of this. The annual production of cardamoms varies considerably unlike arecanut which is more or less steady. The total annual output varies from 30 to 60 thousand maunds and brings in a gross revenue of nearly 40 lakhs of rupees to the growers.

The marketing system of cardamom is also deplorable and is very unsatisfactory. There are many middlemen in the trade. The big *mandi* merchants of Saklespur and Mudigere (which are the biggest marketing centres) who are financiers, act as *dalals* to other merchants. Thus there are several links, both desirable and undesirable, weak and strong, in the chain of distribution system.

Two co-operative societies were started, one at Saklespur and the other at Mudigere but owing to several causes these have not been functioning properly. We need not go into these causes. The shareholders have not come forward to patronise the societies but on the other hand they have become disloyal to the society either by their own selfish motive or through the instigation of powerful vested interests. However, it is heartening to note that Government have not neglected the interest of the cardamom growers. Government have appointed in their Order No. 2661-66-I. & C. 323-38-4|27|28-11-39, a committee to examine and report on the question of the resuscitation of cardamom industry in the State. It is hoped that the deliberation of the committee will result ultimately in the financing of cardamom growers on easy terms and marketing of cardamoms through a society like the one for the arecanuts.

4. *Oranges.*

Kadur and Hassan Districts between them own nearly 2,000 acres of oranges. Of late, orange planting has been going on apace. This is largely due to fall in coffee prices and also due to large demands for orange fruits. The climate and soil conditions in the two districts are very well suited to raise the fruit without much initial cost. A large area of coffee has been thus inter-planted with oranges. Commercial orchards on sound lines have also come to be established. The trade in oranges in the State has reached nearly 22 lakhs of rupees of which nearly 12 lakhs of rupees worth of oranges are being annually imported. Of course, this is a heavy drain. This drain could be saved to the State by producing more oranges within the State itself. Similarly, other areas in South India, notably in Wynad and Coorg, have taken up planting of oranges on a large scale. This means that in time to come markets will be flooded with oranges of all sorts and severe competition will have to be faced. Therefore, the aim of orange growers in our State should be to produce quality fruit at a cheap cost and market them properly. There should be grading of fruits according to standards and only quality fruits exported. New markets have to be explored outside the State and dependence upon local markets should be restricted.

With a view to stimulate orange growing in the two districts which command so many natural facilities, Government have specially sanctioned an Horticultural Inspector, whose duty is to tour in the two districts and tender scientific advice to growers. Recently at the instance of Government, the Malnad Fruit Growers' Co-operative Society has been started at Belur. Mr. E. Studer is the Honorary Secretary. He owns extensive orange groves and has considerable experience in fruit growing on scientific lines. There is no doubt that under his able stewardship of this Society, it will be an unqualified success and an eye-opener to other marketing societies.

Government have very generously granted liberal subvention to this Society for the first year to meet part of the

working expenses. Already many orange growers have joined this Society. Though the Society was started late in this season, it has marketed several lakhs of fruits at advantageous prices so far.

5. *Honey.*

Honey is an article of diet which is highly valued as it is assimilated into the system without undergoing several changes unlike other food products. Unfortunately, the honey one gets in the market is so impure and adulterated that people have gradually come to lose the relish for it. Large quantities of pure honey are imported from foreign countries but this is very costly.

The *malnad* areas of Hassan and Kadur are famous for the quality and quantity of honey they produce. Thousands of small raiyats make a living out of this most important subsidiary industry. Since bees are reared in pots, the honey is extracted in a crude way. Hawkers go from village to village to purchase the honey produced by the raiyats and in many cases raiyats take advances to sell honey to the hawkers during the honey season. Some of the unscrupulous people adulterate honey with jaggery and sugar syrup.

Government having realised the importance of this industry to the welfare of the *malnad* raiyats and also to facilitate the availability of pure honey, have sanctioned special bee-keeping staff to educate the raiyats in the art of bee-rearing in modern improved boxes instead of in pots. Colonies of foreign honey bees have also been imported to try them here. This scheme is in force for the past three years and as a result of propaganda, it has been possible to introduce as many as 547 box-hives in 88 villages. There is keen demand for box-hives which it is difficult to meet. Hives are also sold on hire purchase system and at concession rates to poorer classes of people. This year it is intended to distribute 300 boxes under this scheme.

The Department of Agriculture had to purchase honey produced by their clients as there was no special organisation to deal with it. The raiyats soon began to agitate for

the formation of a Bee-keepers' Society for marketing honey and wax. A Bee-keepers' Co-operative Society has been started at Saklespur recently. This Society has been specially favoured by Government. They have not only given Rs. 500 as a grant for meeting initial expenses but also have sanctioned a loan of Rs. 2,000 towards working capital free of interest, repayable in four instalments. Besides, Rs. 500 worth of timber for manufacturing box-hives has been arranged to be supplied at half cost. To run this Society on efficient business lines and to build up a sound organisation, Government have also kindly sanctioned the free services of a qualified hand on Rs. 60 per mensem for a period of one year as Bee-keeping Inspector.

Conclusion.—I have given above as briefly as possible the advantages of co-operative marketing and also the various attempts that have been made by Government agencies for the increase of production and also for the easy and profitable marketing of agricultural products especially of the *malnad*. Each and every one of the products listed above has received the closest attention of Government and their active support. In other directions also, for instance, growing and marketing of sugarcane, tobacco, silk, figs, etc., Government have either sponsored joint-stock concerns or co-operative marketing societies. These are only a few instances of what a paternal Government can do for the welfare and betterment of agriculturists. It is up to the raiyats to take advantage of all these facilities and actively participate in organisations, specially designed for their benefit and enable to free themselves from the shackles of indebtedness.

Silt

By

Gundappa S. Kurpad, B.A.

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It is a well-known fact that many of our tanks have got silted up to such an extent that demands are being continually made to revise the extent of land that can be irrigated by water that can now be impounded in these tanks. Since the time when the tanks were originally constructed and the irrigable area was determined, there has been a steady silting up of the tanks with the result that the storage capacity of many tanks has been considerably diminished. Various methods have been suggested whereby this silting could be avoided. It seems worthwhile to look at the causes of this process of silting up and to see if anything can be done to prevent or minimise it.

Silt consists largely of the finer particles of soils which are washed down during the monsoon rains. During the monsoon period, we get heavy rains and at such times torrents of water rush down the slopes of land into the depressions, carrying all loose matter with them. This matter is slowly deposited in the depressions and in course of time these depressions are filled up by this transported material. The amount of matter thus transported depends on two factors: one, the looseness of the surface of the land over which the torrents of water pass, and two, the rapidity with which water rushes over the surface. If, therefore, methods can be adopted which will avoid both these conditions, silting up can be prevented.

Taking the first factor into consideration, the surface of the cultivated area of the land is in a looser condition than that of the uncultivated area. If, therefore, the cultivated portion preponderates over the uncultivated in the catchment area of the tank, the chances of that tank receiving a large

quantity of silt are very great. Considering the case of the tanks in the *maidan* area, much of the catchment area consists of cultivated dry lands. Since it is obviously not possible to keep all this catchment area uncultivated, some other method of minimising the carriage of silt from these areas into the tank, has to be considered. During recent years, the area under occupation has tended to increase and one often sees even the fringes of tanks being cultivated. This practice only aggravates the situation. In some few cases, attempts have been made to plant trees in the fringes of tanks. While this is useful to some extent, it does not affect in any way the silt that is being brought down from the higher reaches.

In many cases, part of the catchment area of a tank consists of *gomal* land. Since this is uncultivated scrub jungle and 'pasture' land for the village one might reasonably expect that the surface would be firm and covered over with vegetation and hence the removal of silt would be very little. However, in most places, these areas are so denuded of all vegetation that surface wash is heavy and it is not uncommon to see such areas cut up by *nullahs* of various sizes growing bigger and bigger every year. In cultivated fields the flow of surface water is checked to a certain extent by the small bunds demarcating the fields but in *gomal* lands there is not even this small check. If, on the other hand, these *gomal* lands were properly looked after and grown with grass for the village cattle and so managed that the ground is not bare of vegetation, then the surface washing of silt can be minimised to a great extent.

The second point is the contribution made by the slope of the land to the silting up of the tanks. Naturally, tanks are constructed so that they command an extensive catchment area with sufficient slope for the water to run freely into the tank. The very fact that these slopes constitute the dry cultivated area of these tracts, seem to me to make it not difficult to overcome this evil. To those who have visited the real *malnad* area where the chief field crop is paddy, the method of cultivation must be familiar. In this tract

there are no level stretches of land but paddy plots have to be absolutely level. This is achieved by cutting up the slopes of hills into a series of level terraces, sometimes big, sometimes small, according to the slope of the land. These terraced hillsides are a prominent feature of the *malnad* landscape. The dry lands of the *maidan* area do not slope so much as the hillsides of the *malnads*. Therefore the amount of levelling that would be necessary would not be very much. If then these dry areas are levelled and the levelled plots properly bunded, it is obvious that the rush of water to the tanks can be controlled to a great extent. Water can then be led by well-defined channels into the tank and much of the silting avoided. If this work is coupled with the growing of trees rather closely along the fringes of the tank, this belt of trees can act as a silt trap and thus prevent to a very great extent the addition of silt to the tank bed every year.

Incidentally, we shall have done a tremendous service to the dry land cultivators by making them level their plots and bund them properly. Experiments on dry farming in Bombay have clearly shown that in areas of precarious rainfall, in tracts where the rainfall is less than 20 inches a year, such levelling and bunding has not only given the cultivator an assured crop but also a better crop than of old.

The methods briefly described above require a certain amount of technical knowledge of details and concerted action on the part of cultivators over a large area for being really effective.

Summing up, the silting up of tanks can be largely controlled and to a certain extent prevented by (1) proper control of *gomal* and other waste lands and growing suitable fodder grasses on them, (2) proper levelling and bunding of dry lands in the catchment area of tanks and (3) growing a thick belt of trees on the fringes of tanks.

A Note on the Varieties of Bananas (*Bale*) under Cultivation in Mysore State

By

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The area under bananas in Mysore State is about 18,000 acres. Nearly half of this total area lies in Mysore District. Next in importance are Tumkur, Bangalore and Hassan Districts, having about 2,000 acres each. Kadur and Chitaldrug are responsible for nearly 1,500 acres each. The area under this fruit is limited and there is a great scope for its extension, to prevent the large imports into the State.

There are nearly 43 varieties cultivated in the State. All the varieties, with the exception of three or four are used for table purposes. The varieties *Madhuranga, Budabale, Kalyanabale* and *Marabale* are used when green for cooking.

The following are the varieties found in the State:—

1. Rasabale
2. Bilirasabale
3. Karirasabale
4. Anajirasabale
5. Rajabale
6. Puttabale
7. Chandrabale
8. Karibale
9. Pachabale
10. Salem Poovan
11. Marabale
12. Yalakki
13. Vatebale
14. Bilisugandabale
15. Awnbale
16. Koranadu
17. Katora
18. Moorishbale
19. Yelebale
20. Karesuganda
21. Kallubale
22. Kariputtabale
23. Havubale
24. Kayibale
25. Atirasabale
26. Sugandabale
27. Nagabale
28. Cheenabale
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30. Huvubale
31. Gulurbale
32. Kallubale
33. Gujjabale
34. Kathebale
35. Goolabale
36. Kedabale
37. Kattebale
38. Kodathibale
39. Mitlabale
40. Madhurangabale
41. Budabale
42. Kalyanabale
43. Votebale

Bananas are cultivated in the State wherever there is facility for water. They are cultivated as a pure crop in big orchards in Mysore District and parts of Bangalore District. In other parts of the State they are planted

amongst betel vine, arecanuts, cocoanuts and coffee. They are also grown in small quantities in the backyards of houses. The method of planting varies from district to district. Pits are dug ranging in size from 1½ cubic foot to 3 cubic feet and allowed to weather for a short time. Then they are filled up with fresh earth, leaf-mould and cattle manure. The distance from plant to plant either way is between 8 and 12 feet. Healthy suckers are planted in the pits and watered copiously at regular intervals. Water-logging is prevented by having recourse to efficient drainage. The suckers take about 30–40 days to sprout and produce the first pair of leaves. Except in the case of late varieties —*Katora* and *Chandrabale*—the others begin to flower in 9–10 months after planting. The fruits are ready for harvesting three months after the period of flowering. The number of fruits per bunch varies from 50–300, *e.g.*,

Chandrabale	50—60
Pachabale	60–100
Rasabale	80–100
Havubale	100–150
Puttabale	150–200
Yalakkibale	150–200
Karesuganda	200–250
Atirasabale	200–300

During the first year of growth of the bananas, the land is inter-cultivated with some leguminous crop. A successful experiment has recently been demonstrated at the Irwin Canal Farm by inter-cropping bananas with pine-apple. Only once in three years fresh plantings are undertaken but at the end of every year after the fruit is harvested, the central sucker is removed and 3–4 side suckers are given a chance to grow. Large-scale plantings are usually undertaken just before the advent of local showers and also the monsoon. On an average 600 suckers are planted to an acre and it is expected the raiyat earns a net income of Rs. 75–Rs. 100, except in parts of Mysore District, where the orchardist expects a net return of Rs. 200–Rs. 250 per acre by growing *Rasabale*.

'A' Farm of S. 705 Paddy

By

S. G. Rangaswamy, L.Ag.

Sira

At the request of the Department I undertook to conduct an 'A' Farm of S. 705 paddy on my holding this summer and incidentally tried a manurial demonstration on this variety. This is a brief report about it from facts to my personal knowledge.

I selected a compact block of one acre plot, S. No. 119|3, assessed Rs. 5, under the Sira tank. The soil is of a clay-loam type, slightly alkaline and poor in organic matter due to successive cultivation. Rotation is confined to paddy and ragi, double cropped every year. Ragi was the crop previous to the present one. Consistent with the available limited manuring, the out-turn of paddy (*Halubbalu*) last summer was 820 seers and that of the previous crop of ragi was 293 seers. I admit that the out-turn of paddy under the local varieties has never exceeded 1,000 seers on this plot.

For the first time after the last crop, the plot was ploughed twice with the country plough during the first fortnight of December 1939. Ten cartloads of farmyard manure was carted and heaped in the plot for future application.

Twenty seers of S. 705 paddy was obtained from the local Depot and the same was cleaned and dried for a day. On the night of 14th December 1939, it was selected in salt water. Four seers of salt was dissolved in 10 seers of water and the seed was well dipped in this salt water in convenient lots. Light seeds that floated were eliminated and what remained at bottom was taken out, washed in fresh water, mixed with manure, heaped and allowed to germinate. Three guntas of the ploughed plot was ploughed again to fine puddle, manured, and the well-germinated seed broadcast evenly on the 17th December 1939 for nursery.

Light seed eliminated by salt water selection worked out to 6¼% reducing the total quantity of seed sown in the nursery to 18¾ seers.

Between the 18th and the 20th of January 1940, the plot was ploughed thrice and the heaped manure was evenly spread over, ready for transplantation. The half-acre plot demarcated for manurial demonstration was manured with 37½ lb. ammonium sulphate, and 30 lb. concentrated superphosphate evenly. The stand of seedlings in the nursery was quite good. Transplanting was completed in the last week of January. Economic single seedling transplantation with sufficient spacing was followed so that a quantity of seedlings remained over which was transplanted alongside of the local variety in another field. It can be said that the entire area of one acre was transplanted with the nursery raised from 15 seers of virile seed actually resulting in a savings of 50% of seed compared to the local average seed rate of 30 seers.

Irrigation was regularly attended to. One hand weeding was given between the 25th February and the 2nd of March. There was not much perceptible difference to be observed between the check and the manurial plots. Tillering was free and the stand on ear-heads was between 3½ to 4 feet. Ear-heads first appeared by about the end of March and the plot was ready for harvest at the beginning of May. The plot was well rogued of all mixture on the 1st and 2nd of May.

Harvest and threshing were completed between the 4th and the 12th of May. The out-turn on the manured half-acre was 956 seers of grain and (15 bundles) 1,800 lb. of straw; on the check plot of half-acre the out-turn was 1,094 seers of grain and (20 bundles) 2,000 lb. of straw. Thus for the one-acre plot the total out-turn is 2,050 seers of grain and 3,800 lb. of straw.

The manurial effect, however, has not been conclusive probably due to insufficient dosage of organic manure and the unstandardised fertility condition of the plots.

But it is an undeniable fact that the variety is far superior to the local fine varieties inasmuch as it has given me double the yield I have ever harvested on this plot, if not two and a half times, more than my previous paddy crop. Secondly, the grain is fine, fetching a higher price in quality markets. Thirdly, it comes in for harvest earlier by a fortnight than the local *Halubbalu* variety. Finally, the grains do not shed off the ear-heads in the field in spite of the stormy and rainy weather that prevails in May. With better tillage from improved implements and adequate manuring, the out-turn of this variety can be appreciably raised. With all these features the variety is excellent and well suited to the locality.

I thank the Department of Agriculture, for having given me an opportunity to come to definite conclusions from practical demonstration on my own field about this superb strain of paddy, S. 705.

Agricultural Colony in the Irwin Canal Area

Proceedings of the Government of H. H. The Maharaja of Mysore

Order No. R. 6721-80|*L.R.* 245-37-19, *dated, Bangalore, 22nd May* 1940

The question of starting an Agricultural Colony in the Irwin Canal area to afford facilities to suitable educated young men to engage themselves in agriculture has been under consideration for some time past. A Committee consisting of the Revenue Commissioner in Mysore, the Chief Secretary to Government and the Director of Agriculture in Mysore, was requested to go into this question and submit a workable scheme for the consideration of Government, indicating the lines on which the Colony may be established and providing necessary safeguards so that losses similar to those which have occurred in the Bhadra Colony may not arise.

2. The Committee have submitted their proposals, the main features of which are as follows:—

(*i*) Persons who have read up to the S.S.L.C. standard and who are either graduates in Agriculture or have passed out of the Agricultural School, may be taken as colonists, the selection being made by a Committee appointed for the purpose.

(*ii*) To start with, ten colonists may be selected.

(*iii*) The Colony should be under the direct charge of the Manager of the Irwin Canal Farm and the general supervision over the Colony should be vested in a Committee consisting of the Director of Agriculture as Chairman, the Deputy Commissioner, Mysore (now Mandya District), the Executive Engineer, Irrigation Division, Mandya, the Secretary of the Mysore Sugar Company and two non-official members, one from each of the Mandya and Maddur Taluks.

(*iv*) Each colonist should be given 15 acres of land on lease for a period of six years, the amount of lease being nominal and equal to the assessment on the lands.

(*v*) If the colonists succeed, the land may be conveyed to them at the end of six years at a fair upset price which may be fixed at the present market value of the land, the price being recovered in ten annual instalments from the date of sale.

(*vi*) The Government should advance to each colonist a sum of Rs. 1,500 on account of capital cost to be incurred on the following items of expenditure and a further sum of Rs. 500 annually for meeting working expenses. The amount required for cultivation should be advanced on the security of the crops to be grown on the land and recouped every year as soon as the crops are harvested.

Capital Cost—

House and cattle shed	Rs. 1,000
Two pairs of bullocks	„ 300
Ploughs and other agricultural implements	„ 200
	Rs. 1,500
Working expenses to be recouped from the crops grown	„ 500
	Rs. 2,000

(*vii*) Each colonist should give a deposit of Rs. 1,500 in token of his earnestness and as security for the amount advanced by Government.

(*viii*) The Sugar Company should be requested to buy all the sugarcane grown in the Colony.

(*ix*) The colonists should be encouraged to take to industries subsidiary to agriculture, such as poultry-farming, dairying, sheep-breeding, etc.

3. The Committee consider that under the triennial rotation of crops and with the growing of money crops in the Colony the income for each colonist will be about Rs. 600 per annum. The scheme is estimated to cost Rs. 20,000, which will be advanced to the colonists free of interest.

4. Government are pleased to sanction the scheme as outlined above with the modification that the deposit to be made by each colonist may be reduced to Rs. 1,000. The advances made to the colonists will carry no interest for the first four years and will bear interest at four per cent. per annum thereafter. The balance of advance after adjustment of the deposit will be recovered in five equal annual instalments after the fourth year. But if the colonist selects to purchase the land, the purchase price will include the balance of advance that may be due by him. Necessary provision will be included in the budget of the next year for the purpose.

5. Government are also pleased to direct that a Committee consisting of the following persons be appointed to work out the further details and give effect to the scheme:—

(1) The Director of Agriculture in Mysore (*Chairman*).

(2) The Deputy Commissioner, Mandya District.

(3) The Secretary, Mysore Sugar Company.

(4) The Executive Engineer, Irrigation Division, Mandya.

(5) Mr. B. Venkatanaranappa, M.A., Retired Professor of the Central College, Bangalore.

(6) Mr. R. K. S. Mather, Gundlupet.

(7) A member from the Mandya or Maddur Taluk.

6. The Director of Agriculture is requested to select in consultation with the Revenue Commissioner suitable lands in a compact block if possible and give wide publicity to the scheme, invite applications from qualified educated men and start the Colony very early. He may dispose of the applications as they are received without waiting for the full number required.

(*Sd.*) S. K. Venkataramana Iyer,
For Chief Secretary to Government.

SELECTIONS

Coconut Poonac as a Food for Livestock

BY

M. Crawford, M.R.C.V.S.

To breeders of livestock in Ceylon, coconut poonac is of special interest because it is produced locally and in large quantities. At a time such as the present when supplies of imported foodstuffs are precarious it becomes of even greater interest and importance. With shortage of supplies and rising prices of other foodstuffs coconut poonac will of necessity have to enter even more largely than in normal times into the rations fed to livestock.

It is of value at such a time to consider how best this foodstuff can be utilized for various classes of stock.

It is hardly necessary to state that there are two important types of coconut poonac available in Ceylon, namely, *chekku* poonac, operated by crushing copra in the local type of press, or *chekku*, operated by bulls and mill poonac produced by crushing copra by various types of machinery in modern mills.

Analyses of both types are given below. It will be seen that the most important difference between the two types is that *chekku* poonac contains a very much higher percentage of oil than mill poonac. Indeed the proportions of oil is so high that makes *chekku* poonac definitely unsuitable for feeding in any considerable amount to some classes of livestock.

This type of poonac is produced in small quantities as compared with mill poonac and finds its greatest use as a food for cart bulls engaged in heavy work. If used for dairy cattle the amount fed per day should be limited as large quantities are likely to depress the milk yield and lead to an overfat condition of the cows. It may be used more liberally for young growing cattle but any tendency of the cattle to become overfat, especially in the case of heifers, should be checked as soon as noticed by reducing the quantity. As a food for pigs, *chekku* poonac is definitely unsuitable for the production of the best quality pork as the carcass of pigs fed largely on it will be excessively fat. It is also unsuitable as a food for hens for the same reason.

With these few remarks about *chekku* poonac we will pass on to mill poonac which is available in much larger quantities and is more generally used.

Mill Poonac

Physical Characteristics.—Coconut poonac differs from other poonacs such as gingelly, earth nut, linseed, etc., as it is much softer and absorbs water very readily. On account of this its keeping qualities are not so good as of other harder poonacs. Unless stored in a very dry atmosphere it is apt to become rancid and mouldy rather rapidly.

For this reason it is not wise to lay in large stocks unless a good dry store-room is available.

When soaked in water it swells very considerably. If fed dry in large quantities there is danger of the stomach becoming over-distended. To avoid this it is the usual practice to soak it well before feeding.

Coconut poonac has a very distinct taste and smell of its own. Livestock which have not been accustomed to it often refuse to eat it at first, but they soon become used to it and eat it readily.

Chemical Composition.—The composition of an average good sample is given in the table. This shows that coconut poonac falls into the class of foodstuffs moderately rich in protein such as palm-nut cake or undecorticated cotton cake. It contains considerably less protein and more carbohydrate than such foods as gingelly, earth nut or linseed poonacs. The oil content is roughly the same as in linseed cake. The total mineral content is round about the same as in most other oil-cakes or poonacs. A feature of the mineral content which requires to be borne in mind is that it is very poor in calcium. Coconut poonac is a good source of supply of phosphorus but a poor source of calcium.

The oil contained in this poonac is a "hard" oil. Butter made from the milk of cows fed on it will be firm in consistence as will the fat of pigs which have been fed largely on coconut poonac. This is a valuable property, especially in a warm climate.

An interesting fact about the composition of coconut poonac is that its nutritive ratio, that is, the proportion of protein to carbohydrate and fat, is 1 to 4. This one to four ratio is the generally accepted correct ratio for a balanced ration for milk production in cattle, for young growing pigs, and for egg production in poultry. In other words, coconut poonac is in itself a balanced ration and can be added to any balanced mixture of foodstuffs without altering the nutritive ratio. Any livestock owner who is using a mixture of foodstuffs which has been compounded so as to form a balanced ration can add coconut poonac to the mixture in any quantity required without the necessity of working out rather complicated calculations.

The points to be observed when feeding coconut poonac to various classes of livestock are summarised below.

For Cattle.—It has been stated above that coconut poonac is in itself a balanced ration for milk production. That means that it contains protein in the correct proportion to carbohydrate and fat. It is not, however, safe to assume that coconut poonac alone as the concentrate ration will be ideal for dairy cattle. For instance, such a ration would certainly contain too little calcium to supply the needs of a milking cow.

There are many cows in Ceylon which receive little else than coconut poonac as a concentrate ration. Such cows may milk well and look well as a rule, but it is not uncommon to hear their owners complain that they experience difficulty in getting such cows to calve regularly. The cause of this difficulty is most likely the deficiency of calcium and possibly in addition an overfat condition of the cows as a result of depending too much on coconut poonac alone. The deficiency in calcium can be corrected by adding a simple mineral mixture such as two parts of ground limestone or coral and one part of common salt to the poonac and it is strongly recommended that in all cases where coconut poonac forms a large part of the ration such a mineral mixture should be used. Three pounds of the mixture of limestone and salt should be added to each 100 lb. of poonac.

The deficiency of calcium in coconut poonac can also be corrected by including in the diet some foodstuff which is rich in calcium. Prominent among foods which can be added to coconut poonac for this purpose are gingelly poonac, any of the pulses such as dhal husk, and gram.

This method of correcting the deficiency of coconut poonac is better than the addition of a mineral mixture because the calcium as contained in such foods as gingelly is more readily assimilated by the cattle than when it is in the mineral or inorganic form. The obvious drawback, of course, is the higher price of gingelly poonac as compared with the cost of a mineral mixture and in war time the fact that the bulk of our supplies of gingelly poonac have to be imported.

For Feeding of Pigs.—Coconut poonac is very largely used as a pig food in Ceylon. Pigs are often reared on a diet which consists largely of coconut poonac and water-grass.

Such a diet may give satisfactory results if the pigs are allowed free range and so enabled to supplement the diet by other foods which they root up when foraging. For pigs which are kept confined in styes, this diet is not quite adequate. It supplies all the protein, fat and carbohydrates required, indeed rather too much fat, but it does not supply sufficient calcium and iron. The rate of growth of young pigs on such a diet is often slow and older pigs often develop stiffness of the joints which is usually attributed to rheumatism. This slow

growth rate and stiffness are both symptoms of calcium deficiency and indicate the desirability of supplementing the diet with calcium. This can be done by adding the mixture of salt and limestone mentioned above at the rate of 3 lb. of the mixture to each 100 lb. of poonac.

For Horses.—Coconut poonac is seldom or never fed to horses in Ceylon but it has been used in other countries with satisfactory results. It may be substituted for oats in approximately equal quantities.

It is not likely to prove a good food for race horses but could safely be used for hacks and polo ponies.

For Poultry.—Coconut poonac is not suitable to form any considerable proportion of the diet of laying hens because of its fattening properties. This applies especially to hens kept in confinement. It may be used to supplement other foodstuffs but should not form more than 10 per cent. of the mash.

For young growing cockerels it may be used more freely and for such birds it is a useful food.

Analysis of Mill and *Chekku* Poonac

	Mill Poonac per cent.	*Chekku* Poonac per cent.
Water	11·4	12·4
Oil	8·0	15·0
Protein	21·2	18·0
Carbohydrate	42·4	41·0
Fibre	11·5	5·6
Ash	5·5	8·0

Summary.—To sum up, we have in coconut poonac a very valuable foodstuff suitable for many classes of livestock. Although many other cattle foods may become scarce in Ceylon, as a result of war conditions, coconut poonac is most unlikely to be affected.

Livestock owners can use it more largely than in normal times and should bear in mind when doing so its special qualities as described above. The main points to bear in mind in order to get the best results from coconut poonac are as follows:—

(*a*) Do not store it in a place where it may become damp.

(*b*) Remember that while it is rich in other food constituents coconut poonac is not a good source of calcium. Therefore give along with it either some food which is rich in calcium, for example, gingelly poonac, or dhal husk or add a mineral mixture containing calcium.

(*c*) Do not use coconut poonac too liberally for laying hens, especially for laying hens which are confined to small runs.

—*The Tropical Agriculturist,* Vol. XCIV, No. 3.

The Why and How of Index Numbers

It is becoming more and more important for the farmer and businessman to understand the use of index numbers. Perhaps the most important point to remember when using them is that the base period upon which they are calculated does not necessarily represent an ideal or "normal" period toward which agriculture and industry should strive. Rather, base periods are merely a mathematical device used to simplify comparisons made between index numbers.

The use of index numbers to measure economic conditions has increased rapidly in the last few years. Much use of them is made by businessmen, bankers, economists, newspaper editors, and others interested in business conditions. The newest significance of index numbers from the farmer's point of view is perhaps the use being made of them in connection with the Agricultural Adjustment Programmes.

Index Numbers are Ratios

The two kinds of index numbers most used are (1) those measuring changes in physical volumes, such as the index of industrial production, and (2) indexes of prices. When the latter kind of index expresses the prices of only one commodity over a period of time, it is called a price relative.

Index numbers are figures which express the changing values of any series of physical units or prices. These values are expressed as ratios to the value in some period chosen as a base.

Why Use Index Numbers

The two chief uses of index numbers are (1) to compare present prices or quantities with some past period, and (2) to facilitate comparison between two or more current quantities or prices that are not expressed in the same units. The first use may be illustrated with wheat prices. The Oklahoma farm price of wheat averaged 78 cents a bushel in 1934 and 85 cents in 1935. How significant is this increase? Here is where a price relative is useful. If the 1934 price is used as 100 per cent., divided into the 1935 price and the result is multiplied by 100, the 1935 relative is 109; in other words the price of wheat was 9 per cent. higher in 1935 than in 1934.

Expressing prices in terms of percentages is even more useful when the second function of index numbers is considered. If a farmer should want to compare the above price rise in wheat with changes in cost of production, for instance labour, an index number comes in handy. Thus the average monthly wages for farm labour in Oklahoma were $17.00 in 1934 and $17.90 in 1935. If the 1934

value is again used as 100 per cent., the relative for wages in 1935 is 105 per cent. This increase of 5 per cent. contrasts with a rise of 9 per cent. for wheat prices.

Weighting Index Numbers

When an index number of prices is constructed, the different products are usually weighted so that the most important product will have the most influence on the index. To show the necessity for weighting, in the following example an index of meat animal prices has been so calculated that all commodities have equal weight regardless of their actual importance.

Commodity	Base price per cwt. (average 1910–14)	July 15, 1939 price per cwt.
	$	$
Cattle	4·83	6·00
Calves	5·97	7·40
Sheep	4·62	3·70
Lambs	5·82	7·60
Hogs	7·04	6·10
Total ..	28·28	32·80

$$\frac{\text{July 15 total (32·80)} \times 100}{\text{Base price total (28·28)}} = 109 \text{ the index number for July 1939.}$$

The following table shows the same prices expressed as an index number but weighted according to their importance:

Commodity	Weights (average marketings 1924–28) cwt.	Base price per cwt. (average 1910–14)	Base price × weights	Price per cwt. July 15, 1939	July 15 price × weights
		$		$	
Cattle ..	5,140	4·83	24,826	6·00	30,840
Calves ..	462	5·97	2,758	7·40	3,419
Sheep ..	13	4·62	60	3·70	48
Lambs ..	30	5·82	174	7·60	228
Hogs ..	1,247	7·04	8,779	6·10	7,607
Total ..			36,597		42,142

$$\frac{\text{July 15 total (42,142)} \times 100}{\text{Base price total (36,597)}} = 115 \text{ the weighted index number for July 15, 1939.}$$

It will be seen that the second index is 6 points higher than the first. This is chiefly because sheep prices were low and consequently pulled the whole index down in the first calculation. However, since

sales of sheep are relatively unimportant in this (Oklahoma) State, in the second calculation sheep prices are weighted by only 13 cwt. as the amount marketed, in comparison with 5,140 cwt. for cattle marketings. Because of this, sheep prices have very little effect on the index, and since all other prices are well above the base period, the index is 115. In any system of weighting, revisions must be made from time to time as the importance of various commodities changes.

The Base Period

A statement like "1910–14 = 100" means simply that this period has been chosen as the basis for comparison. An ideal base period should be (1) in the immediate past if possible so that it will resemble the current period and be remembered by most of the people using the index, (2) a series of years for which ample data are available, (3) long enough so that opposite fluctuations in value will counteract each other, and (4) a very important consideration, in a time of relatively stable economic equilibrium.

Although the 1910–14 period obviously does not satisfy all these requirements, many statisticians and economists hold that its disadvantages are more than overcome by the fact that prices then were more nearly stable than has since been the case. It is perhaps true that with all its weaknesses, this period is the only one approaching a state of equilibrium nearly enough to be useful as a basis for comparison. Those advocating this base period also point out that world monetary conditions at that time were unusually stable. Further, in answer to the criticism that farm prices were at an all-time high in relation to other prices, they contend that there was nothing in the economic situation to drive agricultural prices to abnormal heights, and that therefore this must have been a natural development.

1910–14 *too Far Back.*—Certainly these years are not in the immediate past. Most farmers and agricultural workers now under 45 years of age had little or no business experience as early as 1914. This is one of the strongest arguments presented for changing the base period to the twenties.

Even if it is accepted that the relationship between agriculture and industry was normal from 1910 through 1914, the many changes which have come about in the national economy since that time tend to minimize the usefulness of a comparison with that period. In the first place, America's position as a debtor nation supplying the world with raw materials has changed to that of a creditor nation whose world markets apparently are fast disappearing. Again, the mechanisation of agriculture, the decline of horse and mule numbers with the consequent releasing of approximately 20 million acres of crops to feed other animals, and the tendency toward producing more

hogs and dairy cattle and fewer beef cattle have all changed the picture. The nature of agricultural production and its costs have themselves undergone significant changes. Also the Federal Reserve System, the Farm Credit Administration, and other credit facilities have come into existence, thus modifying the nation's credit structure. New transportation facilities, roads and marketing techniques have been developed. In addition, the devaluation of the dollar has affected each portion of the price structure differently.

As far as the second point, availability of data, is concerned, for many important components of index numbers it is impossible to secure accurate information for pre-War years. Other important commodities, such as automobiles and many kinds of machinery, either were sold in a very limited quantity or had not yet appeared on the market in 1910–14. This disadvantage is lessened somewhat, of course, by the use of weights that are based on later periods such as 1924–28 and are periodically revised to fit new conditions.

In regard to the third point, length of period, the five years included from 1910 through 1914 may be enough in this case because of stable prices although it is often thought wise to include a long enough period to cover the entire upward and downward swing of the business cycle.

Economic Stability in 1910–14

Those attempting to establish "parity" conditions in agriculture through the Agricultural Adjustment Programme have apparently assumed that economic equilibrium existed from 1910 through 1914, since the 1938 Agricultural Adjustment Act states that:

> "Parity as applied to income shall be that *per capita* net income of individuals on farms from farming operations that bears to the *per capita* net income of individuals not on farms the same relation as prevailed during the period from August 1909 to July 1914."

It is true that prices of both agricultural and non-agricultural products were then more nearly stable for an extended period than ever before or since, but it is also true that farm prices, except during the World War, have never been so high in relation to non-farm prices as during the "Golden Age" of August 1909–July 1914. Because this particular period has been used as a base the ratio of prices received to prices paid by farmers has always, with the exception of the War years, shown their purchasing power to be less than 100, and therefore thought of as below "normal" when actually farmers during 1910–14 may have been enjoying a price differential which was not at all "normal" and could not last. This is an extremely important fact to keep in mind when using index numbers—

that is, to remember that the base period, rather than being a "normal" or standard of perfection toward which the economy should strive, is merely a mathematical device used to make comparisons between different statistical time series more convenient.—MARJORIE HILL.

—Extracted from "Current Farm Economics," Oklahoma, Series 49, Vol. 12, No. 4.

Figures are omitted.

The Control of External Parasites of Poultry; The Control of Mites and Lice on the Poultry Plant

The presence of lice and mites, both upon poultry and in the houses, constitutes a definite menace to the health and egg production of the flock. While the proprietors of modern specialized poultry plants are likely to be aware of this fact and hence continually watchful for the presence of external parasites, this is not always the case by any means. On the other hand, the small flock owner and general farmer is not so constantly moving among his birds, and where trapnesting is not done, the birds may be handled so rarely that infestation may escape notice. Heavy infestations of these vermin are known to cause unthriftiness in birds of all ages and loss of egg production in pullets and hens.

BODY LICE

Body lice are to be found at all seasons of the year. They live upon the body of the bird and are rarely found off the body. Examination of birds, particularly in the regions of the vent, tail, neck-feathers and under the wings should reveal their presence, particularly if the infestation is heavy. Since the lice do not exist in the house but upon the body of the bird, the method of treatment must be determined with this fact in mind.

The simplest and most effective treatment is by the use of nicotine sulphate* (40% solution) which may be secured from any poultry supply house or seed merchant. The containers in which this product is supplied are so equipped that it is possible to flow a fine line of the sulphate along the top of the roost. This is best done just before roosting-time. When the birds are roosting their body heat causes fumes to rise from the nicotine sulphate through the feathers of the bird and lice are killed and fall to the dropping board. One ounce of this material will suffice for about 30 feet of roost. It should not

* Nicotine sulphate is sold commercially under a number of trade names, such as "Black Leaf 40", "Neotine", etc., etc.

be applied when temperatures are near to freezing because low temperature retards the formation of the fumes which are actually responsible for the killing. A single application should kill all lice, but since many of their eggs will probably be present in the fluff at the base of the feathers and will hatch out within five to nine days, an additional treatment about ten to twelve days later will be necessary to kill these newly hatched "nits".

Other effective but much more laborious methods of killing lice are by means of dusting powders or ointments. Among the materials of this nature powdered sulphur at the rate of one-quarter pound to a quart of land plaster (gypsum), whiting, or even fine road dust is a most economical and satisfactory powder. Other inexpensive and very effective dusting powders are sodium fluoride and sodium fluosilicate. The fluosilicate is particularly good since it acts as a contact as well as a stomach poison, it kills rapidly and is less poisonous to humans than the fluoride. Dusting powders are dusted into the fluff particularly under the wings and around the vent. Mercurial ointment, commonly known as blue ointment, mixed thoroughly with an equal quantity of vaseline, makes an efficient ointment for the purpose but since it is poisonous, must be properly labelled and handled with care. The blue ointment is applied by rubbing a quantity about the size of a small pea on to the skin just below the vent. It should not be used on setting hens as it reduces or entirely prevents hatchability when it comes in contact with the eggs.

The above instructions are applicable and effective for all the important types of lice such as small and large body lice and head lice. Since a dozen lice may increase to thousands in a few months, constant vigilance is necessary for should any escape first treatments, they may very rapidly increase to a major infestation.

Mites

Red Mite.

Mites are amongst the most common and economically they are the most important of external parasites of poultry. Unlike lice, which feed only upon the scales of skin and feather, most mites are blood-suckers and, therefore, cause much physical harm and in some instances even death. Another respect in which most mites differ from lice is that they do not live upon the birds but are found in the cracks and joints of the roosts and house during the daytime and venture forth to feed only at night. Since they puncture the skin to suck blood and do not always return to the same bird at night the possibility of their transferring disease from one bird to another cannot be overlooked.

To determine whether the common roost mite or so-called red mite is present, examine the cracks in the roost, the space between the roost and its support, the board joints in the walls in that area and also the nests and nesting material. The mites are red only when engorged with blood. They may be found to be present only as greyish-white masses of mites together with their cast-off skins and eggs. These mites hide away during cold weather and are essentially a pest of the warm months as opposed to lice which are present throughout the year.

Since, as previously stated, these mites infest the house and equipment rather than the bird, the treatment consists in the application of disinfectants to the areas of the building where they are found.

Many methods for the extermination of these mites are used. The first step is to clean thoroughly the roosts, dropping boards, the walls near the roosts and the nests, burning the nesting material. These areas are then sprayed thoroughly with any strong disinfectant solution, amongst which the coal-tar disinfectants* are very satisfactory. Care should be taken to see that all crevices are penetrated to the bottom by the disinfectant. Ordinary coal-oil will kill the mites, but as it evaporates quickly the effects are not lasting. An excellent "paint" to apply to the roosts and nest-boxes is composed of one part crude carbolic or, possibly better still, nicotine sulphate, to three or four parts of coal-oil or a mixture of coal-oil and crank case oil. With fresh clean nesting material supplied there should be little fear of reinfestation.

Northern Fowl Mite.

The northern fowl mite, unlike the red mite, remains upon the birds night and day. Also in contrast to the red mite, they are found upon the birds in the winter, and leave them during the warm months. Besides being present upon the birds they also may be found in any part of the poultry house. Since they have been found in the nests of many species of wild birds, preventing such birds from nesting about poultry buildings may help to control the mode of entry of these vermin. Also, since they multiply very rapidly and are present upon the birds night and day, the fact that they are blood-suckers becomes of great importance and might be taken to indicate that the irritation which they cause does a great deal of harm to health and production. When present they may be seen in the region of the vent and tail particularly, and their eggs may be found plentifully at the base of the feathers in this area. As they come to the surface

* Sold under numerous trade names such as Izal, Lysol, Cresol, Hypro, Zenoleum, etc., etc.

of the feathers when a bird cools off after death, they are often introduced to a poultry plant by purchased birds, hence suitable precautions should be taken.

The fact that these mites are found both on the birds and about the house complicates methods of eradication. For the birds themselves an ointment made of two parts of vaseline to one part of naphthalene flakes has been found to be satisfactory. This ointment is rubbed on to the skin in the areas around the tail and vent. Nicotine sulphate has not been found to be as successful with these mites as with lice.

In so far as the house is concerned, a thorough spraying of the whole pen with any of the strong disinfectants is reasonably successful. Since the mites are found in the litter, this should also be sprayed, raked over to bring the litter which has not been touched to the surface and the spray again applied.

Scaly Leg Mite.

This mite is exceedingly small and burrows into the flesh under the leg scales of the birds. It is a blood-sucker and through its activities causes thickening and deforming of the scales to such an extent that the leg may be almost twice its normal size in severe cases. The treatment of this condition consists of the application of lard containing six per cent. carbolic acid or the dipping of the legs in crude petroleum or kerosine. If the condition persists, a second treatment may be necessary.

Disinfection

With the exception of the nicotine sulphate treatment for lice, and that recommended for the scaly leg mite, most of the treatments considered have entailed disinfection of a portion of the house, or of house and equipment. It becomes necessary, therefore, to know something about the efficiency of the disinfectants available as well as which disinfectants combine efficiency with low cost.

There are many very efficient disinfectants available upon the market. Their relative strength can be determined by their phenol (carbolic) coefficient which is indicated upon the package. For example, if a product has a phenol coefficient of five it would indicate that this disinfectant is five times greater in strength than carbolic acid. Thus different disinfectants may be readily compared by this coefficient and their relative economy determined upon the basis of their cost.

A home-mixed disinfectant particularly effective for mites may be mixed as follows: Dissolve one pound and a half of concentrated lye in as small a quantity of water as possible. It will be necessary to do

this two or three hours before it is required, as the lye should be cold when used. Put three quarts of raw linseed oil into a five-gallon stone crock and pour in the lye very slowly, stirring meanwhile. Keep on stirring until a smooth liquid soap is produced, then gradually add two gallons of crude carbolic acid or commercial cresol, stirring constantly until the resulting fluid is a clear dark-brown colour. Use two or three tablespoonfuls of the mixture to a gallon of water. This disinfectant is usually used as a spray. If a disinfectant to be applied with a brush is desired for roosts, nests, etc., a mixture of one part of crude carbolic acid to three or four parts of a mixture of coal-oil and crank case oil will be found to be very satisfactory.

It should be mentioned that if roosts, dropping boards and nest-boxes are removable the efficiency of disinfecting of the house is very greatly increased.

—*Circular No.* 152, *Dominion of Canada Department of Agriculture.*

Natural Incubation

The tremendous growth of the poultry industry is due in large part to artificial methods of incubation. This development has resulted in the old natural methods of incubation being placed very largely in the discard. It has come about as a result of the increased use of small incubators on farms for the hatching of chicks for individual farmers or his neighbours; the more recent installation of large machines where custom hatching is done; and the establishment of large commercial hatcheries where eggs are purchased from farmers or breeders and chicks are sold to farmers according to their needs.

However, there will probably always be individual cases where natural methods will still be used, and for the benefit of those who desire it, the following information is given.

Time of Incubation

The time necessary for the incubation of eggs of different species of domestic fowl varies rather greatly. The average incubation period for various birds is as follows:—

Hens	21 days
Guineas	25 „
Ducks	28 „
Turkeys	28 „
Geese	30 „
Muscovy ducks	35 „
Pheasants	25 „
Pea fowl	28 „
Pigeons	18 „

The time required varies, however, not only according to species but according to local conditions. The period may be lengthened or shortened by influences that increase or decrease the average temperature at which the eggs are kept throughout the period of incubation. Close sitting hens will usually hatch the chicks a few hours earlier than hens that do not sit so closely or are often off the eggs. In warm weather eggs will usually hatch earlier than in cold weather. Newly laid eggs hatch earlier than eggs that have been held and other things being equal, white-shelled eggs usually hatch sooner than dark-shelled eggs.

Newly laid eggs set under close sitting hens or in warm weather usually start to hatch the 19th or 20th day, and the hatch is completely cleared up by the end of the 21st day. Chicks so hatched are generally more vigorous than those from hatches where the hatch is delayed or prolonged.

As previously mentioned the artificial methods of incubation have practically replaced natural methods on all commercial plants, and only in exceptional circumstances is it advisable to use the hen as a hatcher. Where hens are to be used to hatch any considerable number of chicks, however, great saving in labour and efficiency may be effected by judicious methods of management.

Selection of Eggs

Eggs for hatching should be selected from strong, vigorous, well-matured stock, and should be as uniform in size as possible and normal in every respect, of good shape and with shells of sound texture. Oversized or undersized eggs, eggs showing ridges or porous shells should be discarded as unsuitable for setting.

How Nests are Made

Nest boxes can be arranged around the walls of the house, and if necessary they may be piled up one on top of the other. Better results will usually be obtained by keeping them on an earth floor, but if lack of space makes it necessary to place them one on top of the other, place a moist sod in the bottom of the nest and shape out a shallow centre before covering with a layer of lawn clippings, cut straw or hay. This nest box, which contains three nests, can be made from a 12-foot* board, 12 inches wide. Cut the board in four 3-foot lengths and use one length for the top of the nests, one for the bottom and one for the back. Leave the inch opening at the top of the back for ventilation. The remaining length will make three

* If a board slightly longer and wider is used it will make a roomier nest, which will be better for larger hens.

of the 1-foot square partitions. The other partition and the slats for the front must be secured elsewhere. This provides for three nests. The fronts are hinged at the bottom and the cross-pieces have shoulders that brace the doors in a horizontal position when open. These open doors form an alighting board for the hens when the nests are placed one above the other.

Follow a System

Those who have tried hatching by hens know how cranky a broody hen can be, and when natural means are followed without any system it is a trying ordeal. When a system is followed and proper arrangements are made before-hand, the work is much lessened and the annoyance almost entirely done away with. By the adoption of the following method, chicks can be hatched by hens with comparatively little trouble, few eggs will be broken, and almost perfect control may be exercised over the sitting hens. By testing the eggs twice, the nests are kept full, the hen's brooding capacity increased and a great saving is made in the work, as a short time for supervision once a day is all the time that is required.

Setting the Hen

When the hen is broody dust her well with dry sulphur or insect powder and after dark move her from the nest in which she is sitting into the broody nest that is already arranged as before described; put some dummy eggs under her for a day or two until she becomes thoroughly settled.

It is a good plan to tend the setters in the evening as there will be less tendency for the hens to remain off the eggs too long. The number of eggs to use to the setting will depend on the size of the hen and the time of the year she is set. Early in the season when the weather is cold, fewer eggs should be allowed. A hen that will cover fifteen eggs successfully in the warm weather may hatch fewer chicks in cold weather if she is given that number than if she were only allowed to sit on ten eggs. On trying to cover the larger number, as the eggs are shifted from the centre to the outside and from the outside to the centre of the nest, each egg may be successively chilled, with the result that the whole hatch is spoiled.

Set a Number of Hens at the Same Time

Where it is desired to hatch a considerable number of chicks as many hens as possible should be set at one time. The eggs may be tested at the end of the first week and all infertile eggs or eggs containing dead germs may be removed and the remaining eggs combined under some of the hens. The other hens may then be reset

on a fresh lot of eggs. A second test may be made at the end of the second week, and eggs containing dead chicks removed. By this method greater results may be attained.

Never set hens in the same pens with the laying flock. They should be removed and set in a separate room or colony house, and it is well to have light burlap attached to the front of the nest, so that the nest may be kept darkened until the hen is thoroughly settled in her new quarters. In cold weather the burlap may be kept over the front of the nest throughout the whole hatching period, except when the hens are off to feed.

Hens are best fed dry feed when sitting. Hoppers or dishes of grain, grit and shell should be set on the floor where the birds will have ready access to them, and also a liberal supply of fresh water so that the birds may quickly consume what they desire and be ready to return to their nests in a short time.

When a large number of hens are set in the same room it may be advisable to let them off in relays, but where there are only ten or a dozen they may be all let off at one time. If on returning to their nests they do not go to the same nest, it does not matter so long as the attendant sees that every nest is occupied.

Some hens do not sit as well as others, and it is sometimes an advantage to let one hen off earlier than three weeks, while others are such good sitters that they can be kept hatching for four or five weeks. In some cases if they continue to set well and to keep in good flesh they may be kept at work even longer before they are allowed off with chicks or put back into laying pens.

While the hens are off, take a careful look over the nests for broken eggs. If any damage has been done take out every broken shell, and if the contents have smeared the other eggs wash them with lukewarm water, and it may be necessary to renew the litter.

All Hens not Alike

Some hens, though they become broody, are fickle and do not make good sitters. Just when they appear to be getting down to business they pick up and leave. Others are so clumsy and awkward that they will break almost every egg in the nest. It is, therefore, advisable to watch the sitters, and if any hen proves unreliable, put another in her place at once.

As a rule, only hens of the medium or large breeds should be used for incubation. Leghorns and similar varieties, though they may become broody, are generally fickle. Hens usually sit better than pullets.

Sanitation

Before starting to set see that the room has been thoroughly cleaned and disinfected and that it is entirely free from mites. Satisfactory results can never be attained where these pests are present, as no hen can remain easy when being bothered by these little blood-suckers.

After each hatch, before the nests are used a second time, all nesting material should be removed and the nest boxes thoroughly soaked in disinfectant.

Everything should be kept clean during the hatch. Each morning when the hens return to their nests, clean the droppings from the floor, as nothing will pollute the air more than a lot of setting hens.

See that the water dishes are cleaned regularly and that fresh water is available whenever the hens are allowed off to feed.

During the hot weather see that the room is well ventilated, as the hens, if too closely confined, may suffer greatly.

Hatching

When hens are being set individually, the less they can be bothered at hatching time the better. Leave them entirely alone until the hatch is cleaned up, or the chickens insist on leaving the nest. When hens are set in groups, however, it is better to remove the chicks as they become active, otherwise they are liable to disturb the other hens that are not due to hatch. This may readily be done by simply running the hand under the hens, and removing the chicks without disturbing the hen. Shells may also be removed so as to leave more room in the nests.

As soon as the hatch is cleaned up sufficient hens should be moved to the brooding coops and the chicks placed with them. Discretion as to the number of chicks to be allowed to each hen must be used, as a hen may successfully brood twenty in warm weather, whereas the same hen will do much better with half that number during a cold period.

—*Circular No.* 150, *Dominion of Canada Department of Agriculture.*

Our Exchange List

1. The Modern Review, Calcutta.
2. The Mysore Economic Journal, Bangalore.
3. The Madras Agricultural Journal, Agricultural College, Coimbatore.
4. The Implement and Machinery Review, London.
5. The Journal of the Mysore Engineering Association, Bangalore.
6. The Agricultural Gazette of New South Wales, Sydney.
7. Malayan Agricultural Journal, Federated Malay States, Kualalumpur.
8. Review of Applied Entomology, The Imperial Bureau of Entomology, London.
9. Indian Farming, New Delhi.
10. The Tropical Agriculturist, Peradeniya, Ceylon.
11. Publications of the Department of Agriculture, Colony and Protectorate of Kenya, Nairobi, British East Africa.
12. Bulletin of Deli Proef Station, Medan, Deli (East Coast of Sumatra).
13. International Review of Agriculture, International Institute of Agriculture, Rome, Italy.
14. Publications of the Department of Agriculture and Labour, Government of Porto Rico, San Juan P. R.
15. Lingnan Science Journal, Lingnan University, Hongkok, Canton, China.
16. The Indian Veterinary Journal, Madras.
17. Bulletins of Agricultural Experiment Station, State College of Washington, Pullman, Washington.
18. The South African Sugar Journal, Durban, South Africa.
19. Bulletins of the Agricultural Experiment Station, Georgia, U.S.A.
20. Do. Do. University of Maryland, Maryland, U.S.A.
21. Do. Do. New Brunswick, U.S.A.
22. Do. Do. The Pensylvania State College, Pensylvania, U.S.A.
23. Do. Do. Michigan State College, Michigan, U.S.A.
24. Do. Do. University of New Hampshire, Durham, N.H., U.S.A.
25. Do. Do. University of Idaho, Idaho, Moscow, U.S.A.

26. Bulletin of the Colorado Experiment Station, Colorado, U.S.A.
27. Do. the Missouri College of Agriculture, Columbia, Missouri, U.S.A.
28. Do. the Agricultural Experiment Station, Stillwater (Oklahoma), U.S.A.
29. Do. University of Arizona, Tucson, U.S.A.
30. Do. Brookings, South Dakota, U.S.A.
31. Bulletins of the Agricultural Experiment Station, La Fayette, Indiana, U.S.A.
32. Do. Do. Gainesville, Florida, U.S.A.
33. Do. Do. Newark, Delaware, U.S.A.
34. Do. Do. Fruit Station, Missouri, U.S.A.
35. Do. Do. Corvallis Oregon, U.S.A.
36. Do. the Virginia Truck Experiment Station, Norfolk, Virginia, U.S.A.
37. Bulletins of the Agricultural Experiment Station, Pineapple Canner's Station, Honolulu, Hawaii, U.S.A.
38. Bulletins of the West Virginia University, West Virginia, U.S.A.
39. Bulletins of the Agricultural Experiment Station, University of Nebraska, Lincoln, Nebraska, U.S.A.
40. Do. Do. University of Montana, Montana, U.S.A.
41. Do. Do. Virgin Islands, U.S.A.
42. Do. Do. Texas, U.S.A.
43. Union Des Agricultures, D'Egypte, Cairo, Africa.
44. Bulletins of the Virginia Agricultural Experiment Station, Blacksbury, Virginia, U.S.A.
45. Bulletins of Agricultural Experiment Station, Island of Guam, Guam, U.S.A.
46. Do. Do. University of Illinois, Illinois, U.S.A.
47. Bulletins of the University Library, University of California, Berkeley, California, U.S.A.
48. Philippine Agriculturist, Laguna, Philippine Islands.
49. Bulletins of the State College of Washington, Western Washington Experiment Station, Puyallup, Washington, U.S.A.
50. Bulletins of the South Carolina Experiment Station, Clemson College, South Carolina, U.S.A.
51. Bulletins of the Agricultural Experimental Station, Logan, Utah, U.S.A.
52. The New Zealand Journal of Agriculture, Department of Agriculture, Wellington, New Zealand.

53. The Journal of the Madras Provincial Co-operative Union, Madras.
54. Industry, Calcutta.
55. Bulletins of the Department of Agriculture, Canada.
56. Tamil Nadu Co-operative Federation Journal, Coimbatore.
57. Publications of U.S. Department of Agriculture, Washington, U.S.A.
58. Bulletins of the Minnesota Agricultural Experiment Station, University Farm, Minnesota, U.S.A.
59. Bulletin of the Imperial Institute, London.
60. Publications of the Imperial Bureau of Soil Science, England.
61. Bulletins of the Rhode Island State College Agricultural Experiment Station, Kingston, Rhode Islands, U.S.A.
62. Cyprus Agricultural Journal, Cyprus.
63. Bulletin of the Pan American Union, Washington, D.C., U.S.A.
64. Journal of the Department of Agriculture of Victoria, Melbourne.
65. Bulletins of the Agricultural Experiment Station, Wooster, Ohio, U.S.A.
66. Bulletins of the Vermont Agricultural Experiment Station, Berlington, Vermont, U.S.A.
67. Bulletins of the Imperial Bureau of Fruit Production, England.
68. Publications of the Science Museum, London.
69. Nagpur Agricultural College Magazine, Nagpur, India.
70. Publications of the Indian Central Cotton Committee, Bombay.
71. The Journal of the Jamaica Agricultural Society, Jamaica.
72. Bulletins of New York State College of Agriculture, Ithaca, New York.
73. Hyderabad Farmer, Hyderabad Farming Association, Hyderabad (Dn.).
74. Publications of the National Agricultural Research Bureau, Nanking, China.
75. Annual Report and Seasonal Notes of the Department of Agriculture, Punjab, Lahore.
76. Poona Agricultural College Magazine, Poona.
77. Mysore Information Bulletin, Bangalore.
78. Kisan, Khagoul Road, Patna.
79. Publications of the Society of Biological Chemists, India, Bangalore.

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